APPENDIX B

EQUIPMENT OPERATION GUIDELINES AND FIELD FORMS

B.1
PHOTOIONIZATION METER

B.1.0 GUIDELINE

The guideline for operational check, operation, and maintenance of photoionization meter is outlined below. Operational checks will be performed daily in accordance with the manufacture's instructions. The manufacture's operation manual should be consulted for detailed instructions concerning the operation of various makes and models of photoionization meters.

B.1.1 Operational Check

1. Check to see that the batteries are sufficiently charged.
2. Confirm that the instrument is in the survey mode or read mode
3. Confirm that the previously entered standard gas value is consistent with the current gas value. Make adjustments as required.
4. Connect the standard calibrations gas bottle.
5. Turn the calibration gas cylinder on.
6. The reading should be close to the actual gas concentration. If not wait a few seconds and then repeat this process until the calibration gas has stabilized to 1-2 ppm with the calibration gas range.
7. Exit the calibration mode, turn off the gas and disconnect the calibration gas cylinder from instrument.

The calibration gas typically used for calibration is isobutylene at a concentration of 100 ppm. The use of this calibration gas will result in a reading of 100 ppm in the calibration mode.

B.1.2 Operations

1. Turn the instrument on.
2. Place sensor near the sample or location to be measured.
3. After the necessary measurements have been observed and recorded, turn the instrument off.

B.1.3 Preventive Maintenance

After daily use of the photoionization meter for field investigations, the unit shall be inspected and cleaned as necessary. The battery should be recharged daily (if needed) while in continuous use.

B.2
WATER LEVEL INDICATOR

B.2.0 PROCEDURE

The procedure for operation and maintenance of the water level indicator is outlined below. The operation manual supplied by the manufacturer should be consulted for instructions concerning the operation of various makes and models.

B.2.1 Calibration

Calibration will be performed periodically to determine if the measuring scale on the water level indicator is accurate. Calibration will consist of verifying water level measuring increments, against a calibrated measuring device. This calibration procedure should be conducted on a quarterly basis by rental agency.

B.2.2 Procedure

1. Unlock protective casing and remove well cap.
2. Lower decontaminated water level indicator into monitoring well until indicator sounds and light is illuminated.
3. Confirm that the water surface has been contacted by repeatedly raising and lowering the indicator until a consistent sounding level has been reached.
4. Mark the line of indicator (where water surface has been contacted) by pinching the line between the thumb and forefinger while holding the line level with the measuring point at the well head.
5. Measure and record depth (nearest 0.01 feet) to the water surface in field log book.
6. Lower indicator to well bottom and record total depth.
7. Retrieve and decontaminant water level indicator. Note in log book, observations of silt or product residue on tip of water level indicator.

B.2.3 Preventive Maintenance

The water level indicator should be rinsed with soapy water and then DI water after each reading. Solvents may be used sparingly to aid in the removal of contamination. The probe should always be kept free of silt and product coatings. If solvents are to be used for cleaning, they should be applied to a dye free paper towel, the probe and dirty line wiped, and then rinsed with DI water.

B.3
EBERLINE HP-260/120 OR LUDLUM 12/44-9

B.3.0 PROCEDURE

The procedure for operation and maintenance of the Eberline HP-260, HP-120, or Ludlum 44-9 is outlined below. These units are all very similar in operation. The operation manual supplied by the manufacturer should be consulted for instructions concerning the operation of various makes and models A copy of the manufacturers operation manual for the Ludlum 44-9 is attached for reference.

B.3.1 Operational Check

Background determination and instrument performance as described in this procedure shall be performed prior to the first use of the instrument each day or if sporadic readings occur. Prior to entering a radiological survey area, the instrument should be determined to be fully functional. The calibration controls shall not be adjusted in the field. An operational check shall be performed in the following manner:

1. Visually check the instrument for signs of physical damage and check the calibration status of the instrument.
2. Turn the instrument on.
3. Test the batteries to ensure that the instrument is functional by turning the dial to the “BATT” portion of the scale. The meter should deflect to the battery check portion of the meter scale.
4. Replace the batteries if they are dead and recheck.
5. Press the speaker button to the “ON” position.
6. Set the dial for the appropriate scale.
7. Use the designated beta source identified on the label located on the side of the instrument to determine if the instrument is functioning. Handle the check source by the outer rim only.
8. Place the source in contact with the middle portion of the detector probe.
9. Verify that the reading obtained corresponds to the beta source concentration.
10. If the reading is not within 20% refer to owner’s manual for further action.

B.3.2 Procedure

1. Determine that the instrument is operational using the procedure listed above.
2. Perform the survey holding the instrument 0.5 inches from the surface to be measured.
3. Note and record reading.

B.3.3 Preventive Maintenance

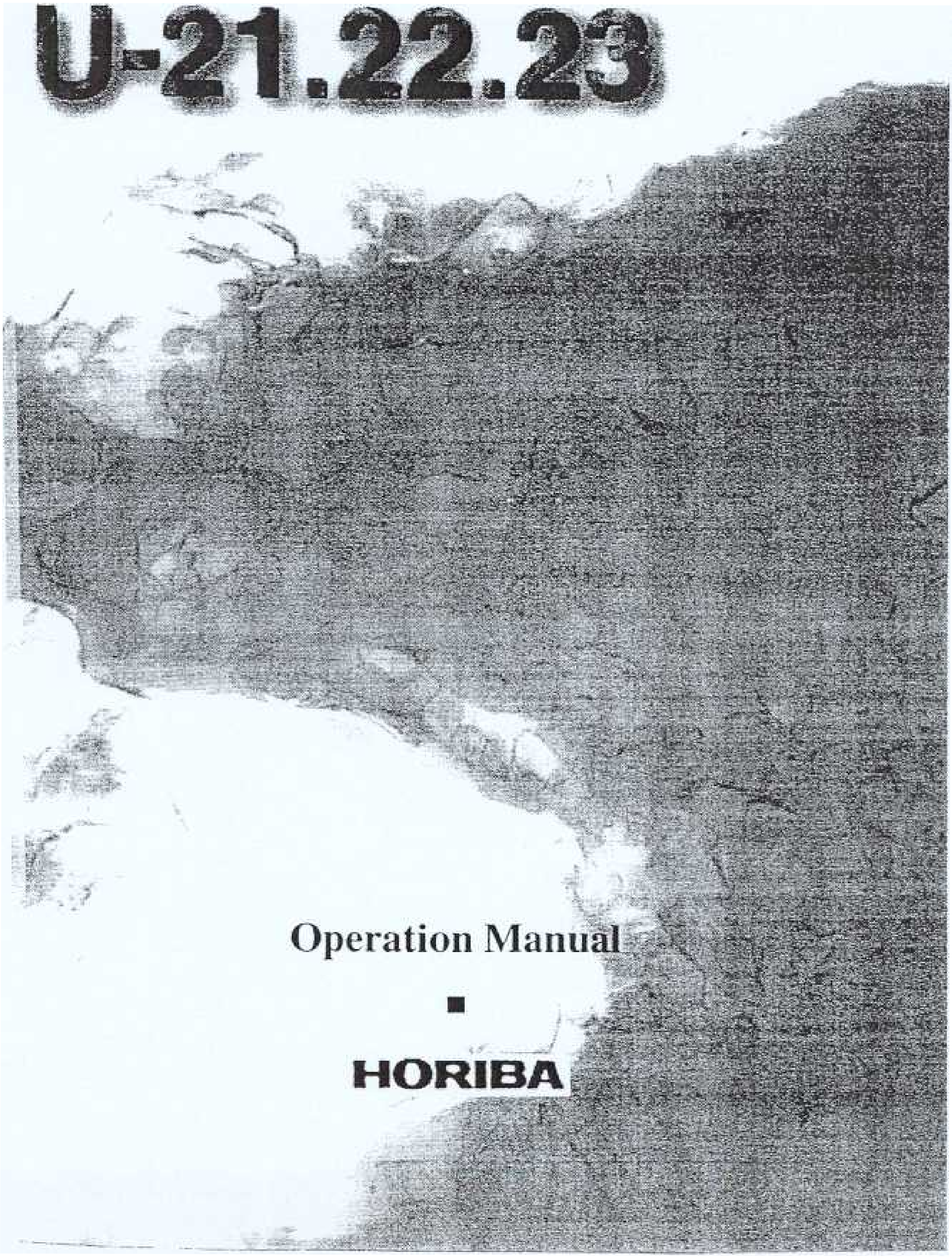
The instrument will be checked daily for signs of physical damage. Calibration adjustments of the instrument shall be performed in a controlled environment by certified personnel.

B.4
MEASURING TEMPERATURE, TURBIDITY, pH AND SPECIFIC CONDUCTANCE WITH THE HORIBA U-22 MODEL SYSTEM

MULTI-PARAMETER WATER QUALITY MONITORING SYSTEM

U-20 Series

U-21.22.23



Operation Manual

■

HORIBA

HORIBA's Warranty and Responsibility

Your U-20 series multi-parameter water quality monitoring system is covered by HORIBA's warranty for a period of one (1) year, under normal use. Although unlikely, if any trouble attributable to HORIBA should occur during this period, necessary exchange or repairs shall be conducted by HORIBA, free of charge. The warranty does not cover the following:

- Any trouble or damage attributable to actions or conditions specifically mentioned in the operation manuals to be avoided
- Any trouble or damage attributable to use of the multi-parameter water quality monitoring system in ways or for purposes other than those described in the operation manuals
- If any repairs renovations, disassembly, etc. are performed on this multi-parameter water quality monitoring system by any party other than HORIBA or a party authorized by HORIBA
- Any alteration to the external appearance of this multi-parameter water quality monitoring system attributable to scratches, dirt, etc. occurring through normal use
- Wear and tear to parts, the exchange of accessories, or the use of any parts not specified by HORIBA

Conformable Directive

This equipment is in conformity with the following directives and standards:

Directives: The EMC Directives 89/336/EEC as amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, in accordance with the Article 10 (1) of the Directive.

Standards: EN55011: 1991 Class B Group I
EN50082-1: 1992

FCC Warning

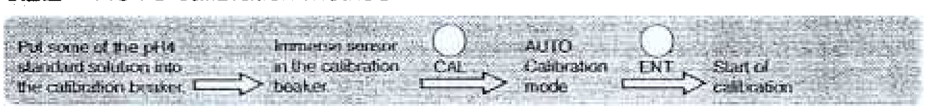
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Unauthorized reprinting or copying of this operation manual

[redacted]

3. Basic operation

The pH, conductivity (COND), turbidity (TURB), dissolved-oxygen (DO), water depth (DEP) and ion (ION1, 2, 3) sensors can be calibrated automatically. Upon completion of this chapter, even beginners should be able to make measurements easily.

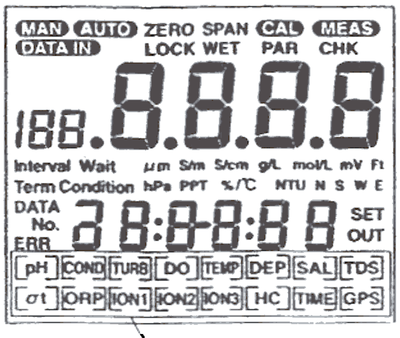


3.1 Key operations and mode switching

Measuring items and displays which are switched with the MEAS key

The items measurable with individual models are displayed. The items selected with the MEAS key will be indicated with [ ].

Example: In the pH Measurement mode: [pH]



Display block

The symbols displayed and their meanings are as follows:

pH .... pH
COND ...... Conductivity
TURB .... Turbidity
DO .... Dissolved-Oxygen
TEMP .... Temperature
DEP .... Depth
SAL .... Salinity
TDS .... Total dissolved solids
σ_t .... Specific gravity of seawater
ORP .... Oxidation-reduction potential
ION1 .... Cl^- (Chloride) ion
ION2 .... NO_3^- (Nitric acid) ion
ION3 .... Ca^{2+} (Calcium) ion
]if standard attachment ion sensors are used
TIME........ Display of date and time
GPS .... G.P.S. (Global Positioning System) for imformation of position

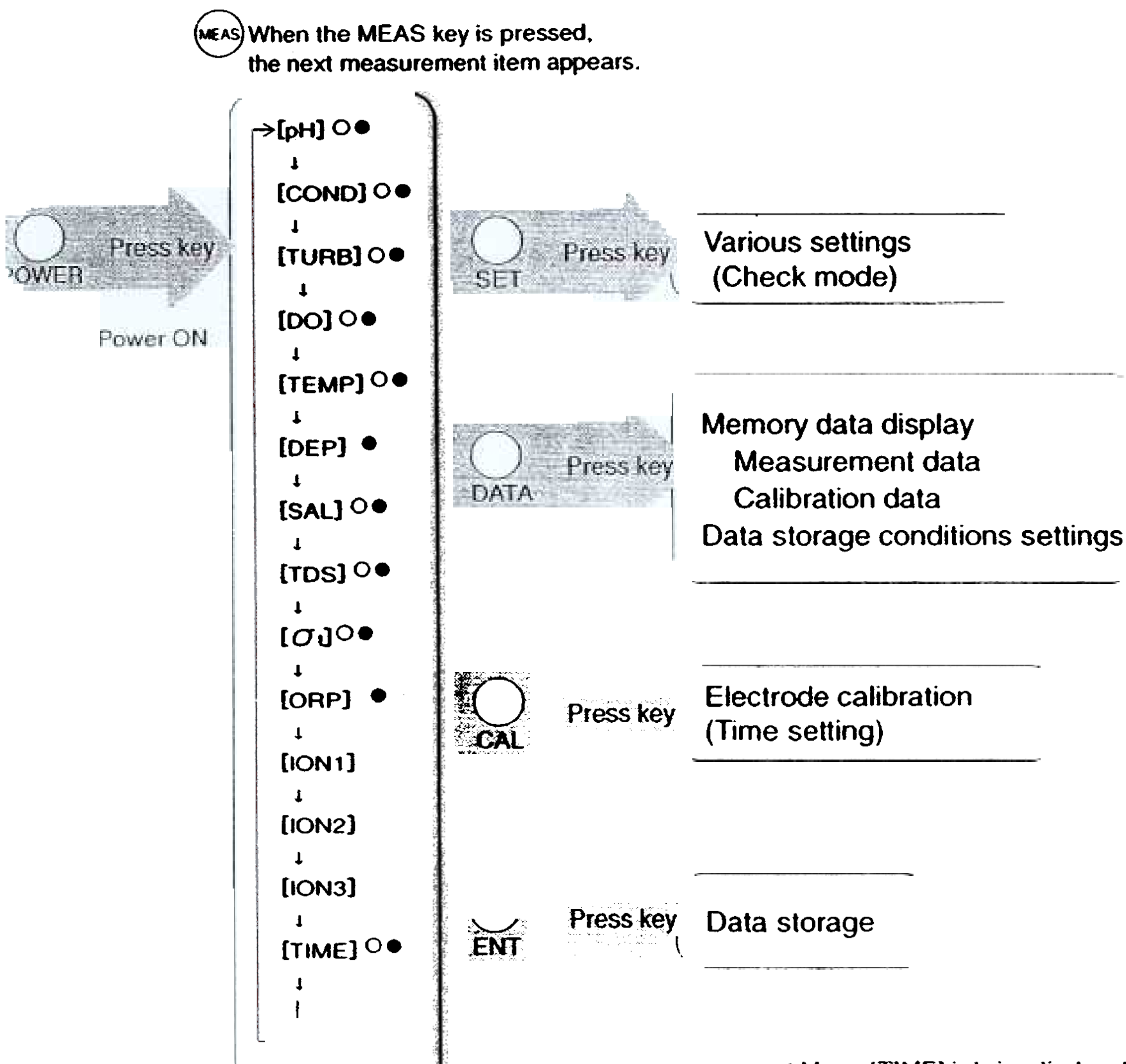
* When optional sensors Cl, C2, and C3 are connected to the instrument, ION1, ION2, and ION3 appears for the optional sensors Cl, C2, and C3, respectively.

Note

- [GPS] lights up when the optional G.P.S. sensor has been connected to the instrument and position information is received from the G.P.S. sensor during the measurement. For more information, refer to the instruction manual for the expansion units.

U-23 Measurement mode

When the MEAS key is pressed, the next measurement item appears.



*Means [TIME] is being displayed.

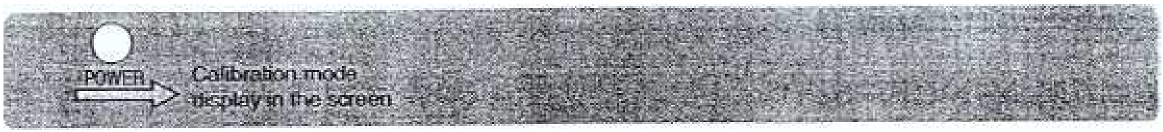
Note

The measurement items for the U-21 model and the U-22 model are indicated with ○ and ●, respectively

"*Measurement item setting*" on page 77 explains how to set the display so items are not displayed.

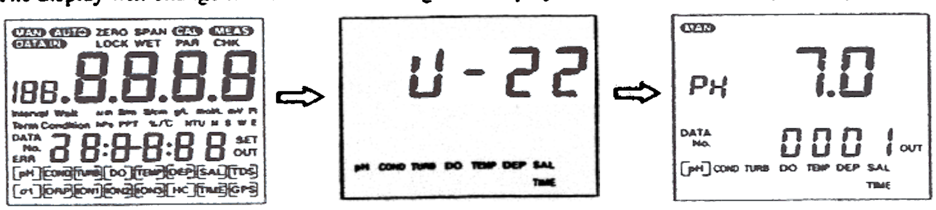
3.2 Operation procedure

3.2.1 Power ON



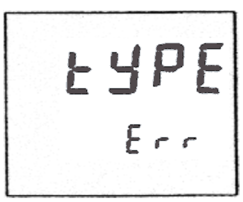
1. Press the **POWER** key.

The display will change in the order of All segment display → Sensor detector display → pH Measurement mode.



For U-22 model

With the sensor probe is not connected,



is displayed.

Before turning ON the instrument, connect the sensor probe properly.

.2.2 AUTO calibration method

obtain correct measurement, it is necessary to calibrate the sensor using the standard solution before performing measurement.

Note

In the AUTO calibration mode, the pH, COND, and TURB sensors are calibrated in the pH4 standard solution, and the DO and DEP sensors in the atmosphere simultaneously.
Values may be unstable if there is temperature fluctuation. Calibrate after waiting for about an hour.

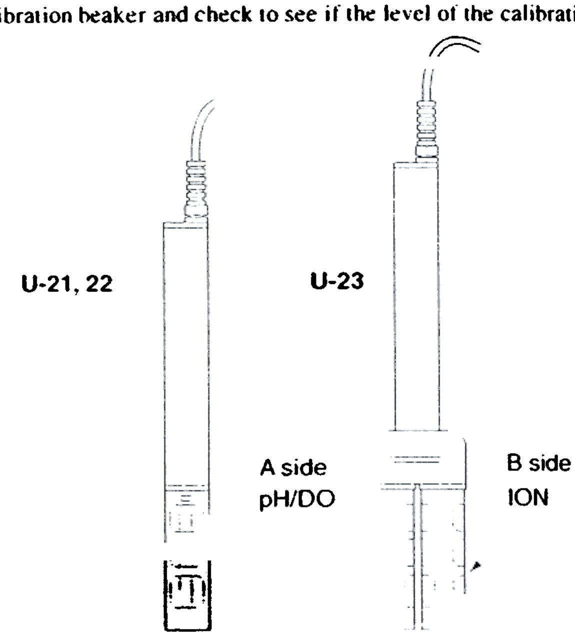
'ut some of the pH4 tandard solution into ıe calibration beaker → Immerse sensor in the calibration beaker → CAL → AUTO Calibration mode → ENT → Start of calibration

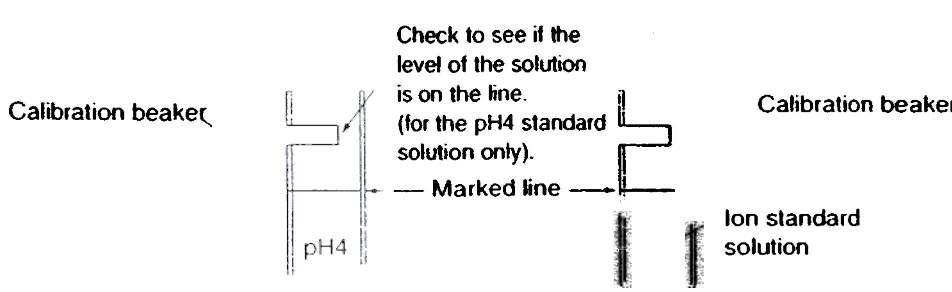
librate using the following procedure.

Wash the sensor in distilled water a few times and put some of the pH4 standard solution into the calibration beaker to the marked line. Then immerse the sensor in it.
For the U-23 model, immerse the sensor A side.

Important

Use the label on the calibration beaker and check to see if the level of the calibration solution is on the label line.

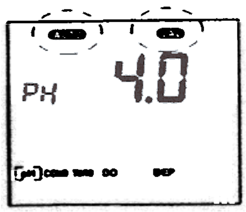




Standard sensor calibration   Ion sensors calibration

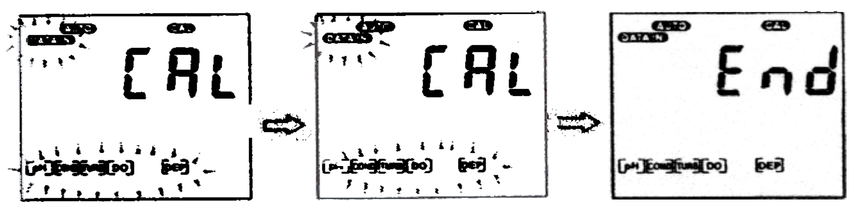
2. Press the **CAL** key in one of the Measurement modes pH, COND, TURB, DO and DEP.

AUTO and CAL appear and the instrument enters the AUTO Calibration mode.



3. Press the **ENT** key to start AUTO Calibration.

Upon completion of all of the pH. COND. TURB. DO. and DEP modes. End will be displayed.
During calibration. DATA IN and [ ] for the selected measurement item blink. [ ] light up for the item of which calibration is finished.

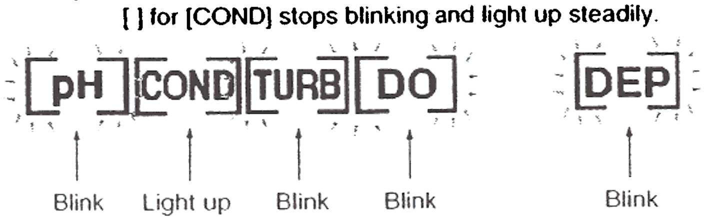


End of calibration

With DATA IN is blinking

To stop calibrating the sensor press the CAL key.
To establish the calibration ... press the ENT key.

Example: When COND calibration is finished:
[ ] for [COND] stops blinking and light up steadily.



Note

- For the U-21 model. measurement of DEP is not performed. and therefore calibration of DEP is not performed.
- [ ] continues to blink because calibration is not performed for the item for which an error has happened. If two or more errors happen. an error with a smaller number appears. (See pages 87 to 89 for these errors and ways to solve them.) These calibration errors disappear when the sensor is calibrated properly again. or when the instrument is turned ON again.
- Calibration should be performed for three minutes. When the indications become stable. calibration should be finished.

4. Press the **MEAS** key to return to the Measurement mode.

Important

- Neutralize any basic pH 4 fluids before disposal

ιUTO calibration of the ion sensors (U-23 model only)

ιandard supplied ion sensors (Cl^-, NO_3^-, and Ca^{2+}) allow AUTO calibration to be performed. If any optional ion ·nsors is used for measurements, be sure to set the ion valency described on page 72 and calibrate the optional sensor anually.

Important

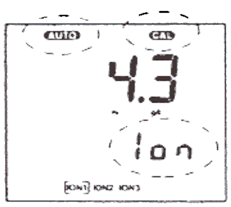
Ion sensors take time to give stable indications. Therefore, immerse the ion sensors in the sample for approximately one hour. Then calibrate the ion sensors and perfom measurements.

Wash the sensor in distilled water a few times and put some of the supplied ion standard solution (#130) into the calibration beaker to the marked line. Then immerse the B side of the sensor in it.

Enter ion measurement mode 1, 2 or 3.

Press the **CAL** key.

AUTO, CAL, and "Ion" below them appear. The instrument then enters the AUTO Calibration mode.

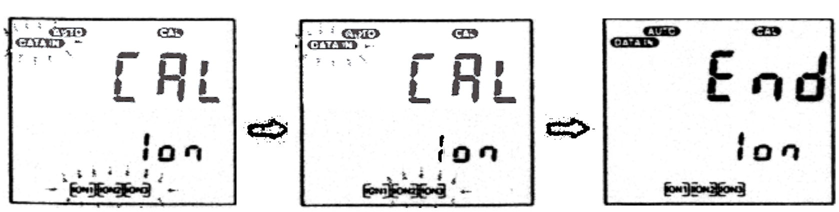


Important

Only the standard supplied ion sensors (Cl^-, NO_3^-, and Ca^{2+}) can be calibrated automatically in the supplied ion standard solution (#130).

Press the **ENT** key to start AUTO calibration.

Upon completion of the AUTO calibration of all the ion sensors ION1, ION2, and ION3, End will be displayed.



End of calibration

With DATA IN is blinking

To stop calibrating the sensor .... press the CAL key.

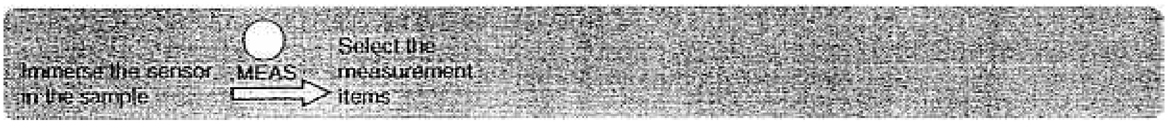
To establish the calibration .... press the ENT key.

Press the **MEAS** key to return to the Measurement mode.

Important

When the AUTO calibration is performed on the ion sensors, the data for the ion sensor calibrated manually is erased.

3.2.3 Measurement



1. Immerse the sensor in the sample.
2. Select the measurement item.

Use the MEAS key to switch measurement items in the following order:

For model U-21
pH → COND → TURB → DO → TEMP → SAL → TDS → σ , → TIME ... then back to pH.

For model U-22
pH → COND → TURB → DO → TEMP → DEP → SAL → TDS → σ , → ORP →
TIME ... then back to pH.

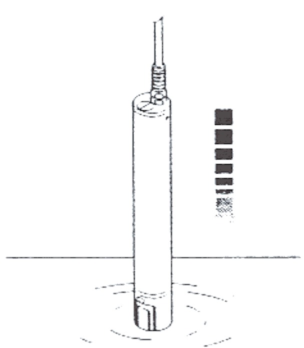
For model U-23
pH → COND → TURB → DO → TEMP → DEP → SAL → TDS → σ , → ORP → ION1 → ION2 fi
ION3 → TIME ... then back to pH.

Note

- [GPS] lights up when the optional G.P.S. sensor is connected to the instrument and position information is received from the G.P.S. sensor.
- The above measurement items can be changed by setting "*Measurement item setting*" described on page 77.

Important

- When immersing the sensor probe in the sample, slowly lower the sensor probe into the sample.



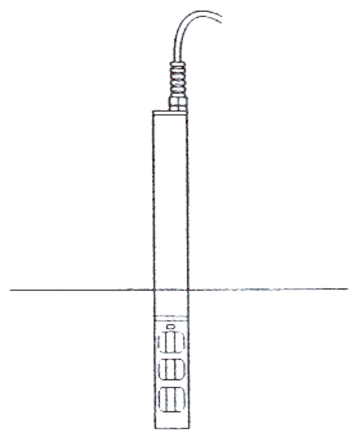
Two useful uses of the U-20 Series models

Making measurements

. Manually storing the measurement data after checking the indication becomes stable

xample: After switching measurement items with the MEAS key, you can then store the measurement data after checking the indication becomes stable.

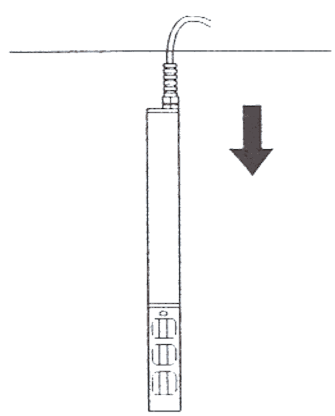
(☞ 4.1 *Manual storage of data while monitoring the measurement data*, page 32.)



. Storing data

xample: Data can be stored continuously at constant intervals from the start of the automatic data storage. This function is useful in obtaining data in depth direction and in storing data continuously.

(☞ 4.2 *Automatic data storage*, page 34.)



Notes in obtaining data on depth

When the instrument is placed at a depth of 100 m or more, the instrument may be broken.

In measurements on the model U-23, the Ca^{2+} and NH_4^+ ion sensors can be used only at depth up to 15 m, and the K^+ ion sensor only at depth up to 3 m. This is because of the properties of the responsive membrane.

Notes for reliable measurements

Any sensor contamination may affect measurements. Use the AUTO calibration mode to check for contamination on sensors about once a week.

Introduction
Before use
Basic operation
Using the data memory function
Techniques for more accurate measurement
Using the various functions
Instrument specifications
Reference data

3.2.4 After completion of measurement

1. Turn the power to the instrument off.
2. Use tap water to completely wash off the sample on the sensor and then wipe waterdrops.

3. Put distilled water into the calibration beaker to the marked line. Then attach the calibration beaker to the sensor probe and store the probe assembly in the carrying case.

Important

- Do not put water in the calibration beaker before attaching it to the ion sensor end (B side) of U-23.

Now you have read the description for performing measurements. For further information on how to use the instrument, refer to the chapters hereafter.

B.5
WELL DEVELOPMENT

B.5.0 INTRODUCTION

The purpose of well development is to stabilize and increase the permeability of the gravel pack around the well screen, and to restore the permeability of the formation, which may have been reduced by drilling operations. The selection of the well development method shall be made by the hydrogeologist and is based on the drilling methods, well construction and installation details, and the characteristics of the formation in which the well is screened. Any equipment introduced into the well during development shall be decontaminated in accordance with procedures described elsewhere in this document.

Each monitoring well will be developed by bailing or pumping. Centrifugal pumps will generally be used to develop shallow wells with high yield. Submersible or positive displacement pumps will generally be used to develop deep wells of low to high yield. Equipment availability or other circumstances may occasion the use of a submersible or positive displacement pump to develop a shallow high-yield well or hand pumps and bailers to develop any well. Physical and chemical parameters including temperature, pH, specific conductance and turbidity of the water will be measured during well development.

B.5.1 Overpumping

The simplest method of well development is by overpumping, that is, pumping at a higher rate than the well will be pumped at when it is purged and sampled. The theory is that any monitoring well that can be pumped sediment-free at a high rate can then be pumped sediment-free at a lower rate.

The main limitation of the overpumping method is that it seldom produces full development, because most of the development action takes place in the most permeable zone closest to the top of the screen. The longer the well intake, the less development will take place in the lower part of the intake. After development of the most permeable zone, water entering the intake moves preferentially through this developed zone, leaving the rest of the well poorly developed and unable to contribute water to the monitoring well.

Another objection to overpumping is that the water flows in only one direction toward the well intake, allowing particles to bridge. If the formation is agitated later during the purging and sampling procedures, these bridges can collapse, and sediment can enter the well during each sampling event.

B.5.2 Backwashing

Backwashing is a development method that can be used in conjunction with overpumping. The backwashing development method will cause reversal of flow through the well intake and agitate the surrounding sediment. This agitation and flow reversal breaks down the sediment bridges. Overpumping then moves the fine particles toward the well and through the intake.

Backwashing in a monitoring well can best be accomplished by adding water to the well. The problem with the added water is that is might not be totally removed during the overpumping, potentially affecting the integrity of water samples taken from the well.

Full development with the backwashing method is very likely. As is the case with overpumping, the backwashing effects will be concentrated in the most permeable zone and near the top of the intake. Other parts of a long intake can thus remain relatively undeveloped.

B.5.3 Mechanical Surging

Mechanical surging as a method of development forces water into and out of the well intake by operating a plunger up and down in the casing, similar to a piston in a cylinder. The plunger used is called a surge block. It may be only a sampling bailer or monitoring well pump, but these will not be affective as a close-fitting surge block.

The proper procedure for mechanical surging is to bail the well first to make sure that water will flow into it. The surge block is lowered until it is below the static water level and relatively gentle surging action is begun. As water begins to move easily in and out of the well intake, the surge block is lowered farther into the well, thus increasing the force of the surging movement. The force exerted on the formation depends upon the length of the stroke and the vertical velocity of the surge block.

The limitation of mechanical surging is much the same as overpumping and backwashing, i.e., it generally affects only the most permeable zone. Surging will be more effective if the surge block is operated within the intake, or screened section. Operating in the well intake will concentrate its action at various levels.

B.5.4 Compressed Air Surging and Air-Lift

Compressed air can be used to alternately surge and air-lift pump the well to remove sediment. In air surging, air is injected into the well to lift the water column. As the water the top of the casing, the air supply is shut off. The water column then falls, causing a surging action in the well intake.

This method is not recommended if volatile organic compounds (VOCs) are expected. Introducing air into a well for well development purposes can drastically alter the water chemistry by oxidation and air stripping the VOCs.

In air-lifting pumping, it is often necessary to install an air line inside an eductor pipe in the well. Eductor systems are generally useful in monitoring well development when limited volumes of air are available or when the static water level is low in relation to the well depth. The eductor pipe system will also minimize the chance of getting a large burst of air injected into the well area and into the formation.

Air surging and air-lift pumping are dependent on both air pressure and air volume. The air pressure must be enough to overcome the initial head created by the submergence of the air line. Once the pressure initiates flow, the air volume becomes the most important factor in successful air-lifting pumping. The initial pressure or starting head is calculated as below.

$$\text{Minimum psi required} = \frac{\text{length of air line} - \text{static water level}}{2.31}$$

The volume of air required to operate an air-lift efficiently depends upon the total pumping lift, the air line pumping submergence, and the area of the annulus between the eductor pipe and air line.

The recommended procedure for using compressed air in a monitoring well is to first set the eductor pipe and air line just below static water level. After pumping at a moderate rate, the eductor pipe and air line can be lowered in steps, which will gradually increase the pumping rate. Once the eductor pipe is in the well intake, the air line should be placed so that its lower end is always up inside the eductor pipe. This will eliminate the chance of getting air injected into the formation and minimize the chance of uncontrolled discharge of water between the eductor pipe and well casing.

The limitation of using compressed air in development of monitoring wells is generally related to pumping submergence. Quite often in a monitoring well, this will cause intermittent flow rather than steady pumping. This is normal in the development methods and does not indicate problems, nor does it interfere with eventual sample integrity.

B.5.5 Equipment and Supplies

- Submersible pump (Grundfos Redi Flow or equivalent) or positive displacement pump (Waterra or equivalent), or bailers
- Tubing, hose
- Foot valves, surge blocks
- Generator and extension cords
- Water level indicator
- Turbidity meter

- pH/conductivity/temperature meter
- Stainless steel equipment
- PID (if required)
- Decon supplies
- Field book and project plans
- Personal protective equipment in accordance with the project Health and Safety Plan.

B.5.6 Well Development Procedures

All piezometer/well development will be documented by the Parsons geologist in the field book. Prior to and following development, all equipment coming in contact with development water will be decontaminated. All development water will be contained in tanks or drums as required by the site-specific work plan.

- Piezometer/well development will not commence until a minimum of 24 hours after installation, or full water level recovery is achieved, whichever is greater.
- Open well and monitor for VOC vapors if required.
- The water level will be measured in each well to the nearest 0.01 foot prior to and after development.
- The wells will be developed until the water in the well is free of visible sediment (50 NTU if possible). Turbidity readings will be taken every 15 minutes. If the turbidity standard cannot be reached within two hours of development, the project manager and USACE will be contacted to discuss alternate development/sampling procedures.
- Well development will be documented in the field book.
- All equipment coming in contact with development water will be decontaminated by methods described elsewhere in this document.

WELL DEVELOPMENT RECORD

Well/Piezometer ____________ Developed By ____________

Time Started ____________ Date ____________

Time Ended ____________

Development Method:

Bail ________ Pump ________ Other ________

Surge ________ Air Lift ________

Approximate volume water removed (gallons) ________

TIME	ELECTRICAL CONDUCTIVITY	pH	TURBIDITY (NTU)	TEMPERATURE
(Start)				
(Finish)				

Comments:

B.6
GPS SURVEY GUIDELINES

B.6.0 SCOPE AND PURPOSE

This section provides guidelines for collecting real-time, differential corrected, survey data using a Trimble PRO XRS Global Positioning Satellite (GPS) receiver and standard Trimble dataloggers/survey controllers. The purpose of this guideline is to outline good surveying practices and provide general guidance in using these Trimble products. This guideline assumes that you have the operating manual for the instrument being used is available and the operator is familiar with menu driven controllers/dataloggers.

B.6.1 General Considerations

Listed below are the major topics that should be addressed prior to arriving on-site to perform GPS surveys.

1) Identify the type(s) of differential corrections that will be available. Use of the Coast Guard beacon frequencies is recommended as this is a radio link and is less susceptible to interference from surrounding objects (buildings, tree canopy, etc.). Coast Guard beacon information can be obtained from the following sources:
   - USGS Navigation Center, 7323 Telegraph Rd., Alexandria, VA, 22315-3998 or,
   - USGS Navigation Center Fax on demand service: (703) 313-5931 or,
   - USGS Navigation Center 24 hour watchstander: (703) 313-5900 or,
   - USGS Navigation Center Internet site: http://www.navecen.uscg.mil.

   If a Coast Guard beacon is not available, identify the Landstar or Omnistar frequencies that are available for your site.

   IMPORTANT: Confirm with the instrument supplier that your unit is equipped to receive the Landstar or Omnistar services.

2) Identify local survey monuments, local bench marks, and/or local HARN (High Accuracy Reference Network) points. These can be obtained from the National geodetic Survey (NGS) information center at (301)713-3242 or on the internet at http://www.ngs.noaa.gov.

3) Identify available power sources. Ensure that sufficient batteries and chargers are supplied with the instrument. Alternative power sources such as power inverters (which can be plugged into vehicle cigarette lighter sockets), camcorder batteries, or small lead-acid batteries (such as lawn tractor batteries) may be needed for extended surveys.

4) The operators should become familiar with the coordinate system(s) (both horizontal and vertical) that they will be working in or as required by the customer.

5) Identify periods during which satellite (SV) availability may be low. (i.e. number of SVs above the horizon)

6) Identify potential interference sources such as tree canopy or tall structures. Determine whether relocation of samples is required or the use of conventional surveying methods is required to obtain accurate data.

B.6.2 Survey Setup

IMPORTANT*: If a cigarette lighter adapter is being used to power the GSP unit,* ***DO NOT*** *turn the vehicle on or off while the power plug is in the lighter socket.*

IMPORTANT*: Operators should always check the cable connections that are being made become familiar with the various cables supplied and the function of each. Most cables will have either a 5 pin or a 7 pin Limo type termination. DO NOT force cable connections into the GPS instruments. When disconnecting cables with Limo type terminations, use the pull cords attached at each connection point to pull the connector straight out. DO NOT use twisting motions when disconnecting Limo type cable connectors.*

Listed below are considerations and general setup parameters that should be used whenever possible. Use of different parameters may be warranted for a particular location, with the understanding that position accuracy may be degraded.

- If the instrument is turned on at a location that is over 300 miles from where it was previously used, or if the instrument was cold booted (to recover from a system lock-up), it may need up to 15 minutes to acquire a new almanac and to identify satellites that are above the horizon.

- Set the GMT time offset for the location you are working in. This option is usually found within the Configuration menu. Note: Eastern Standard time is 5 hours behind GMT, Eastern Daylight time is 4 hours behind GMT.

- Set the coordinate display units and the working coordinate system to those for the project (optional). This is usually done in the Units and Display Menu. Note: these settings affect only how your position is displayed on the GPS unit's screen. The unit should record all horizontal data in Lat/Long and vertical data in ellipsoid height. To view your geoid height, it will be necessary to load (or create) a geoid model within the project.

  NOTE: The conversion from meters to international feet is 3.2808398 feet/meter. The conversion from meters to US Survey feet is 3.28083 feet/meter.

- Set the horizon mask to 15 degrees, the PDOP (position dilution of precision) mask to 6 and the SNR (signal to noise ratio) mask to 6. The horizon mask can be set lower to increase SV availability, but position accuracy will degrade. The PDOP mask can be set higher, but position accuracy will degrade. The PDOP mask should not be set above 12. The SNR can be set lower, but position accuracy will degrade. All of these parameters are normally found in the Rover Options sub-menu of the Configuration Menu.

- Configure the real time correction parameters in the RTCM (Radio Technical Commission for Maritime Services) sub-menu. The RTCM sub-menu is usually found as an F1 hot-key within the Rover Options sub-menu. Choose the best real time source available for the site. If using a satellite service (Omnistar or Landstar), the unit may take up to ten minutes to lock on to the correction transmission. The GPS controller will flash a message at the bottom of the screen to this effect.

- Set the antenna height as accurately as possible. Setting the antenna height to zero will yield points with elevations referenced to the location of the GPS antenna. Note: the antenna height does not affect the calculated position.

- Set the Position Mode to Auto 2D/3D (collects 3D positions when 4 or more SVs are being tracked), Manual 3D (will only collect 3D positions, requires a minimum of 4 SVs), or Overdet. 3D (Overdetermined 3D--will only collect 3D positions, requires a minimum of 5 SVs). The Position Mode selections are usually found in either the Position Filters sub menu, the Set Position Fix Mode sub menu, or the Logging Options sub menu of the Options Menu.

- Create a Rover file or re-open an existing Rover file. This option is usually found in the Files menu or in the Data Capture menu. Record the default name of the file created, or specify and record a file name using the keypad. Keep the file name length to eight characters or less.

B.6.3 Collecting Survey Data

Once the survey parameters have been set, and a survey file has been created or re-opened, feature locations can be surveyed by starting a feature measuring event. This is usually accomplished by going to the Survey Menu and selecting Start Survey, or in some instances, by selecting the appropriate Start Feature option that becomes available immediately after file creation (or after a file has been re-opened). Typically, the operator will want to log Point generic features. Assuming the default logging time for point features is unchanged from five seconds, the GPS unit will measure satellite data for five seconds and record an average position as determined during that time. For greater accuracy, it is recommended that the GPS antenna be held stationary during that time.

Listed below are several important points to be considered while performing a survey:

- Enter a unique location ID (feature Name) for each point surveyed.
- Verify that each point is being recorded (stored) once the name has been assigned and the five second logging cycle is complete.
- Check that the antenna height above the measured feature is equal to the height entered during the survey setup.
- Avoid taking measurements in close proximity to solid objects (including vehicles, buildings, road signs, etc.).
- Monitor the GPS receiver status as indicated on the bottom portion of the logger/controller display. Make sure an RTCM correction is being received, that sufficient SVs are being tracked, that battery levels are sufficient, and that the system is actively tracking a good position. If messages such as "RTK FLOAT", "FLOAT", "AUTONOMUS POSITION", "RADIO LINK DOWN", "RADIO LINK LOST", etc., are displayed, stop and identify the source of the problem.
- Survey files should not be deleted from the GPS logger/controller until the files have been successfully downloaded to a computer and backed-up onto a secondary media, or printed in hard-copy.

B.6.4 QC Checks

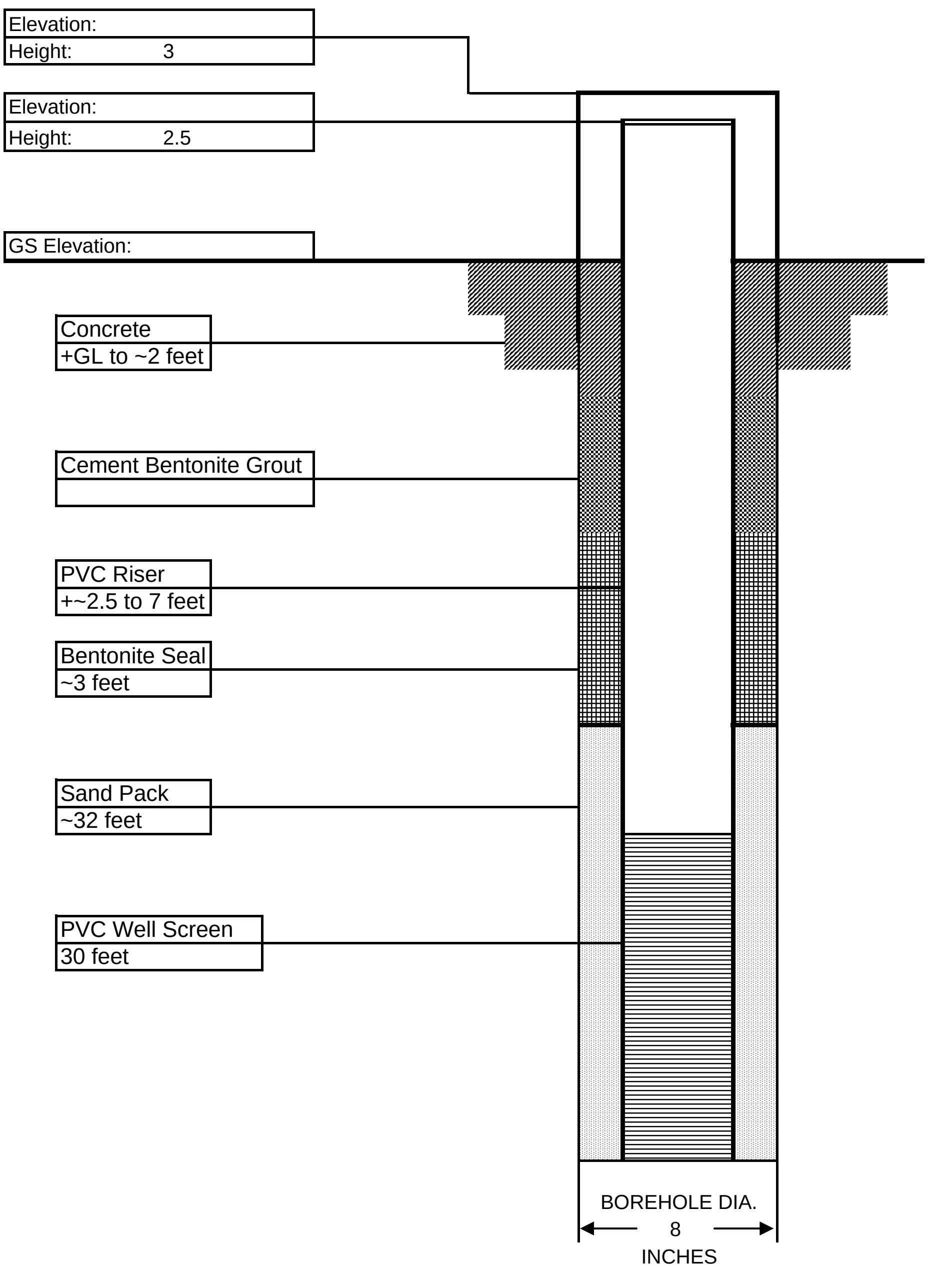
The best method of checking the GPS system is to occupy a known point. If surveyed locations are available, it is good practice to occupy such points before and after each survey outing. Note the differences between the GPS position displayed and the actual coordinate of the point being occupied. If the difference between the two coordinates is greater than those acceptable for the project, stop and identify the source(s) of the error. In general, the more occupations you have over known points, the more confident you can be in the accuracy statements made at the end of the project.

If no known points are available, a second, though less accurate, QC check can be performed by re-occupying points previously surveyed. At a minimum, such checks should be performed before and after each survey outing.

OVERBURDEN WELL CONSTRUCTION LOG

OVERBURDEN WELL CONSTRUCTION LOG

WELL NO.:	FACILITY/SITE NAME:
PROJ. NO.:	CLIENT:
INSPECTOR:	DRILLING CONTACTOR:
DATE START:	DATE END:
LOCATION:	DRILLING METHOD:



PROTECTIVE CASING	
Material:	Steel
Diameter:	4-6 inch
Depth BGS:	~2 feet
Water Tight Seal:	N/A
Flushmount:	NO
Weep hole:	Yes
GUARD POSTS	
Material:	N/A
No. & Size:	N/A
SURFACE PAD	
Composition:	Concrete
Size:	N/A
RISER PIPE	
Material:	PVC
Schedule:	SCH 40
Joint Type:	THREADED
O-ring:	RUBBER
Diameter:	2.0 INCHES
GROUT	
Amt cement:	~94 lbs
Amt bentonite:	~3 lbs
Amt water:	~6.5 gal
Tremied:	
Interval:	
SEAL	
Material:	BENTONITE
Type:	Pellets or Slurry
Amount Used:	
Interval:	
FILTER PACK	
Material:	SILICA SAND
Brand Name:	MORIE
Amount Used:	
Grain Size Dist.:	#0
Interval:	
Tremied:	NO
SCREEN	
Material:	PVC
Diameter:	2.0 INCHES
Slot Size & Type:	0.01" / MACHINE SLOT
Interval BGS:	
SUMP	
Interval BGS:	N/A
Bottom Cap:	YES
BACKFILL PLUG	
Material:	N/A
Setup/Hydration Time:	N/A

PARSONS

DRILLING RECORD

	PARSONS DRILLING RECORD	BORING/ WELL NO. Sheet 1 of
Contractor: **Driller:** **Inspector:** **Rig Type:**	**PROJECT NAME:** **PROJECT NUMBER:**	**Location Description:**
GROUNDWATER OBSERVATIONS	**Weather:** **Date/Time Start:** **Date/Time Finish:**	**Location Plan**

GROUNDWATER OBSERVATIONS				
Water Level				
Date				
Time				
Meas. From				

Sample Depth	Sample I.D.	SPT	% Rec.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL	SCHEMATIC	COMMENTS
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

COMMENTS:

SAMPLING METHOD

SS = SPLIT SPOON

A = AUGER CUTTINGS

GP = GEOPROBE - DIRECT PUSH

PARSONS SAMPLING RECORD

PARSONS
SOIL, SEDIMENT, SURFACE WATER SAMPLING RECORD

SITE NAME: ______________________________

PROJECT NUMBER: __________________________

SAMPLE NUMBER: ________________ SAMPLE TYPE: __________________

DATE: __________________________

SAMPLERS: __________________________ of Parsons

__________________________ of Parsons

DESCRIPTION OF SAMPLING POINT

Sample Location: ______________________________

Water Depth: ______________________________

Sample Depth: ______________________________

Sampling Method: ______________________________

SAMPLE DESCRIPTION

Color: ______________________________

Odor: ______________________________

Other: ______________________________

Sample Analyzed for: ______________________________

QC Samples at this Location: ______________________________

QC Samples Analyzed for: ______________________________

FIELD MEASUREMENTS

Temperature (C/F): ______________ VOCs (FID ppm) ______________

pH: ______________

SAMPLE CUSTODY

Chain of Custody Number: ________ Laboratory: ______________

Shipped Via: ______________ Airbill Number: ______________

COMMENTS ______________________________

____

PARSONS GROUNDWATER SAMPLING RECORD

PARSONS
GROUNDWATER SAMPLING RECORD

SITE NAME: ______________________________

PROJECT NUMBER: ______________________________

SAMPLE NUMBER: ____________________ WEATHER: ____________________

DATE: ____________________ TIME: ____________________

SAMPLERS: ______________________________ of Parsons ______________________________

______________________________ of Parsons ______________________________

DESCRIPTION OF SAMPLING POINT

Sample Location: Monitoring Well MW- ______________________________

Screen/Sample Depth: ______________________________

Sample Method: ______________________________

GROUNDWATER PURGING

Initial Static Water Level: ______________________________

One Well Volume: 3 Volumes

2-Inch Casing:	_____	Feet of Water x 0.16 Gallons/Foot =	_____	Gallons	_________
3-Inch Casing:	_____	Feet of Water x 0.36 Gallons/Foot =	_____	Gallons	_________
4-Inch Casing:	_____	Feet of Water x 0.65 Gallons/Foot =	_____	Gallons	_________

Volume of groundwater purged: ____________ Gallons ____________

Purging Device: ______________________________

Purge Water Disposition (e.g., contained): ______________________________

SAMPLE DESCRIPTION

Color: ______________________________

Odor: ______________________________

Other: ______________________________

Sample Analyzed for: ______________________________

QC Samples at this Location: ______________________________

QC Samples Analyzed for: ______________________________

FIELD MEASUREMENTS

Temperature (C/F): ____________________ Conductivity (μohms/cm): ____________________

pH: ____________________ Turbidity (NTU): ____________________

SAMPLE CUSTODY

Chain of Custody Number: __________ Laboratory: ____________________

Shipped Via: ____________________ Air bill Number: ____________________

COMMENTS ______________________________

____

COOLER RECEIPT FORM

Contractor Cooler________

LIMS#________ QA Lab Cooler #________

Number of Coolers________

PROJECT:________________________________ Date received:________

USE BOTTOM OF PAGE 2 OF THIS FORM TO NOTE DETAILS CONCERNING CHECK-IN PROBLEMS.

A. PRELIMINARY EXAMINATION PHASE: Date cooler was opened: ________________
by (print)________________________ (sign)________________________

1. Did cooler come with a shipping slip (air bill, etc.)? .... **YES NO**
   If YES, enter carrier name & air bill number here: ________________________
2. Were custody seals on outside of cooler? .... **YES NO**
   How many & where ____________, seal date: ____________ seal name:________
3. Were custody seals unbroken and intact at the date and time of arrival? .... **YES NO**
4. Did you screen samples for radioactivity using the Geiger counter? .... **YES NO**
5. Were custody papers in a plastic bag & taped inside to the lid? .... **YES NO**
6. Were custody papers filled out properly (ink, signed, etc.)? .... **YES NO**
7. Did you sign custody papers in the appropriate place? .... **YES NO**
8. Was the project identifiable from custody papers? If YES, enter project name at the top of this form .... **YES NO**
9. Were temperature blanks used? .... **YES NO**
   Cooler Temperature______________(°C) Thermometer ID No.____________
10. Have designated person initial here to acknowledge receipt of cooler: ________________________ (date) ________________

(Continued)

Cooler receipt checklist (Note: LIMS = Laboratory Information Management System) (Continued)

B. LOG-IN PHASE: Date samples were logged in: ____________________
by (print) ____________________ (sign) ____________________

11. Describe type of packing in cooler: ____________________

12. Were all bottles sealed in separate plastic bags? .... YES NO

13. Did all bottles arrive unbroken with labels in good condition? .... YES NO

14. Were all bottle labels complete (ID, date, time, signature, preservative, etc.)? .... YES NO

15. Did all bottle labels agree with custody papers? .... YES NO

16. Were correct containers used for the tests indicated? .... YES NO

17. Were samples preserved to correct pH, if applicable? .... YES NO

18. Was a sufficient amount of sample sent for tests indicated? .... YES NO

19. Were bubbles absent in volatile organic analysis (VOA) samples? If NO, list VOA samples below .... YES NO

20. Was the project manager called and status discussed? If YES, give details on the bottom of this form .... YES NO

20. Who was called? ______________ By whom? ______________ (date)______________

(Concluded)

DAILY CONTRACTOR QUALITY CONTROL REPORT

Contract Number: DACA87-020D-0005

Task Order Number:

Project Name:

Project Number:

Site Location

Date:

Activities Conducted:

Weather Conditions:

Field Instrument Measurements (list or provide attachment):

Equipment Calibrations (list or provide attachments):

List all field and quality control samples collected (list or provide attachment):

Departures from approved SAP:

Problems encountered/resolutions:

Instructions given by government personnel:

Check all attachments:

_________ Table listing all field/QC samples collected

_________ Chain-of-custody forms

_________ Field-generated analytical results

_________ Field sampling forms

Signed by: ______________________________

Name (print): ______________________________

Date: ______________________________

Phone Number: ______________________________

Copies sent to: ______________________________

____

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